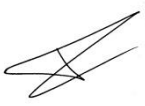
Titre / Title

RF COAXIAL ATTENUATORS
DC – 50 GHz

DETAIL SPECIFICATION

Rédigé par / Written by	**Responsabilité / Responsibility**	**Date**	**Signature**
S. POIZAT	Space Project Manager	08/04/2020	
Vérifié par / Verified by			
V. EUDELINE	Space B. U. Manager	08/04/2020	
Approuvée par / Approved by			
E. ALVES	Space Quality Manager	08/04/2020	

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1 -	08/04/2020	Initial issue

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LIST OF TABLES AND FIGURES

1. SCOPE

This Detail Technical Sheet details the ratings and electrical characteristics for RF Attenuators, Coaxial 0-20 dB, 0 - 50 GHz, 2.4mm series

2. APPLICABLE DOCUMENT

The following documents shall be read in conjunction with this specification:

RAD-GEN-ATCH-002: General Specification: Attenuators and Loads RF Fixed Coaxial

3. TYPE VARIANT

Variant of the basic type covered by the relevant Generic Specification are given Table 1.

Table 1: *Type variants*

Var. N°	Attenuation	Maximum Input Power	Attenuation tolerance Vs frequency		Flatness	VSWR
	dB	W	0 < F ≤ 26.5 GHz (dB)	26.5 < F ≤ 50GHz (dB)	dB	
201	0 (DC shunt)	5	0 / -0.7	0 / -0.7		
202	0.5	5	±0.4	±0.7		
203	1	3.5	±0.4	±0.7		
204	1.5	2.75	±0.4	±0.7		
205	2	2.75	±0.4	±0.7	F ≤ 20 GHz	
206	2.5	2	±0.4	±0.7	0.15 dB / 1GHz	
207	3	1.5	±0.4	±0.7		0 < F ≤ 26.5GHz
208	3.5	1.5	±0.4	±0.7		< 1.3
209	4	1.5	±0.4	±0.7		
210	4.5	1.5	±0.4	±0.7		26.5 < F < 40GHz
211	5	1.25	±0.4	±0.7		< 1.5
212	5.5	1.25	±0.4	±0.7		
213	6	1.25	±0.4	±0.7		40 < F < 50GHz
214	6.5	1.25	±0.4	±0.7		< 1.65
215	7	1	±0.4	±0.7	F > 20 GHz	
216	7.5	1	±0.4	±0.7	0.2 dB / 1GHz	
217	8	1	±0.4	±0.7		
218	8.5	1	±0.4	±0.7		
219	9	1	±0.4	±0.7		
220	9.5	1	±0.4	±0.7		
221	10	1	±0.4	±0.7		
222	20	0.5	±0.5	±1		

4. MAXIMUM RATINGS

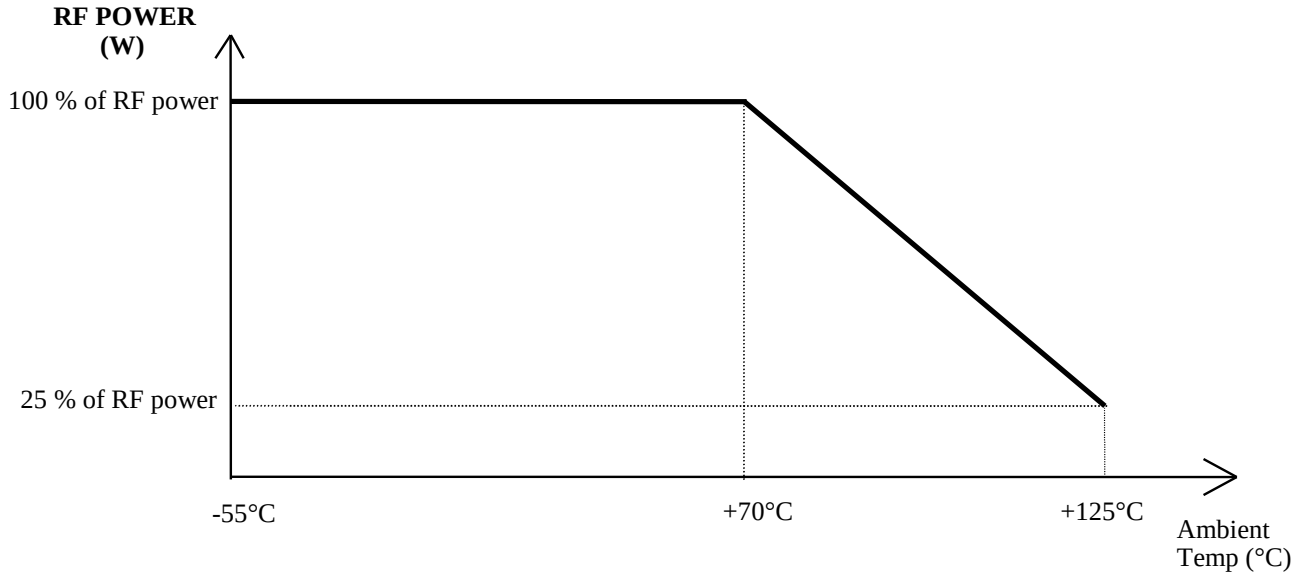
Maximum Ratings of the basic type covered by the relevant Generic Specification are given Table 2.

Table 2: *Maximum ratings*

N°	Characteristics	Symbol	Maximum Rating		Unit	Comment
			Min	Max		
1	RF Power dissipation (1)	P	-	1	W(2)	(0.5W for variant 222)
2	Peak Power (at 25°C) (3)	Pp	-	50	W	-
3	Operating Temperature Range	T_{op}	-55	+125	°C	-
4	Storage Temperature Range	T_{stg}	-55	+125	°C	-
5	Frequency Range	F	0	50	GHz	-
6	Impedance	Z	47.5	52.5	Ω	-
7	DC impedance		3	10	KΩ	between coaxial line and body
8	RF Leakage	E	-85	-	dBi	-
9	Coupling Nut Torque	Tq	80	120	N.cm	-
10	Glitches		0	0.05	dB	

NOTES: (1) See Table 1 for RF input Power value vs attenuation
(2) See Figure 1.
(3) Duration 1µs, cyclic rate 1ms

FIGURE 1 – *Temperature derating*



RF POWER VERSUS TEMPERATURE

5. ELECTRICAL MEASUREMENTS

The parameters to be measured at room temperature are scheduled in Table 1. Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ± 3 °C.
The measurement shall be performed with five points of frequency:

10GHz – 20GHz – 30GHz – 40GHz - 50GHz

6. CONNECTORS REPEATABILITY:

The test shall be performed according to the following conditions:

- Attenuation shall be recorded at three points of frequency: 10GHz – 30GHz - 50GHz
- Ten complete engagements and separations shall be performed, both end separately
- Attenuators shall be rotated through the full 360° with an increment of approximately 36° for each engagement.
- Attenuation drift value: ±0.05 dB
- Side thrust is not permitted during the test
- Cleaning of connectors or reshaping of contacts was not permitted during the sequence

7. OPERATING LIFE

7.1. PARAMETER DRIFT VALUES

The parameter drift values applicable to burn-in are specified in Table 3 of this specification. Unless otherwise stated, measurements shall be performed at T_{amb} = +22 ± 3 °C. The parameter drift value (Δ) applicable to the parameters scheduled, shall not be exceeded. In additional to these drift value requirements for a given parameter, the appropriate limit value specified in Table 1 shall not be exceeded.

7.2. CONDITIONS FOR OPERATING LIFE

The condition for Operating life is given in Table 4. After test, a visual inspection shall be performed and no damage shall be appeared.

Table 3: *Parameter drift values for Operating Life*

N°	Characteristics	Symbol	Test condition	Limits	Unit
1	Attenuation Drift	ΔAtt	As per Table 1	±0.10 or ±1 (1)	dB %

NOTES: (1) Whichever is greater, % of nominal attenuation

Table 4: *Conditions for Operating Life testing*

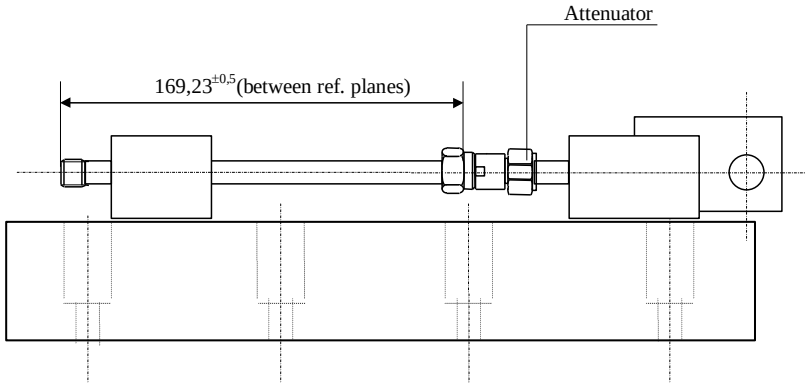
N°	Characteristics	Symbol	Limits	Unit	Note
1	RF Power	P_{in}	See Table 1	W	
2	Frequency	F	DC(1) or 10 or 18 10 or 18	GHz GHz	For attenuation ≥ 1dB For attenuation < 1dB
3	Ambient Temperature	T_{amb}	+70	°C	-

NOTES: (1) The response of the attenuation is flat over the frequency bandwidth.
The dissipated power at DC or in frequency is the same.

Test mounting for Operating life:

The DUT (attenuator under test) shall be mounted directly on the Hybrid coupler without SR cable between the coupler and the DUT.

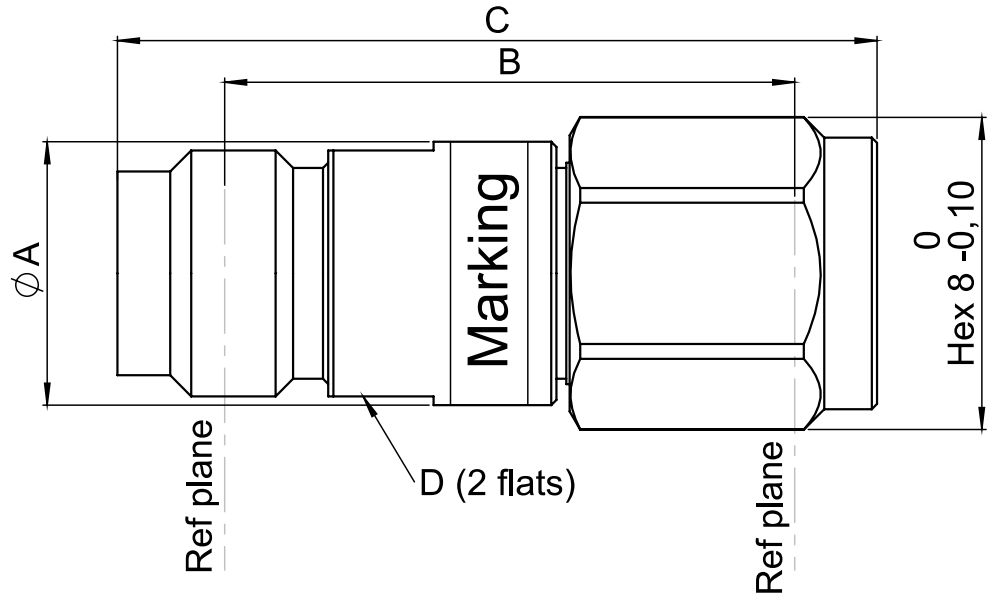
FIGURE 2 – *Circuit for electrical measurement*



Schematic for Vibration and Shock or Bump test

8. MECHANICAL DIMENSION

8.1. DIMENSION FOR VARIANTS 201 TO 222

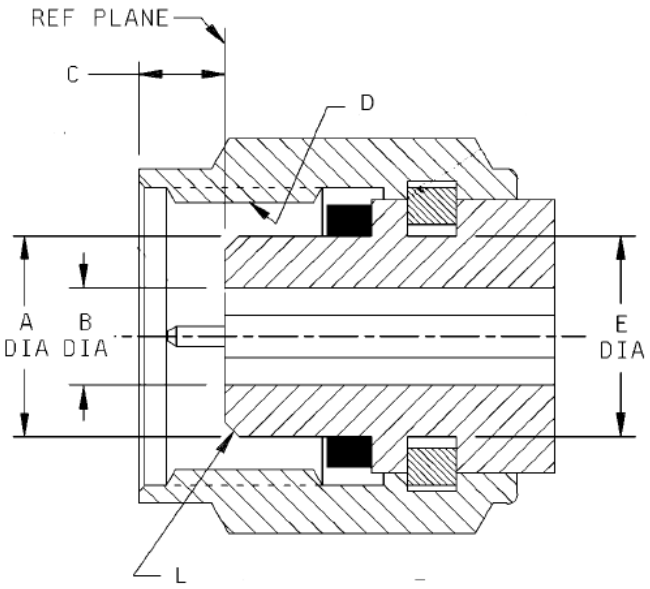


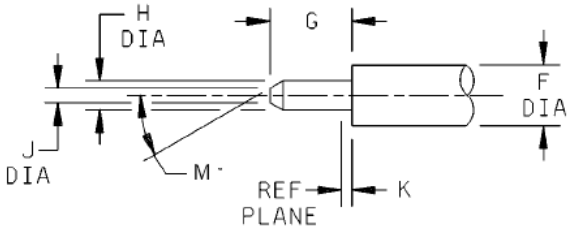
SYMBOL / CHARACTERISTICS	PHYSICAL DIMENSION (mm)	
	Min	**Max**
∅ A	7	8
B	16	16.5
C	-	22
D	6.5	7.5

General tolerance: ± 0.5 mm
Connectors: 2.4mm Male/Female per MIL STD 348A
Weight: ≤ 7 grams

8.2. INTERCHANGEABILITY FOR 2.4MM SERIES

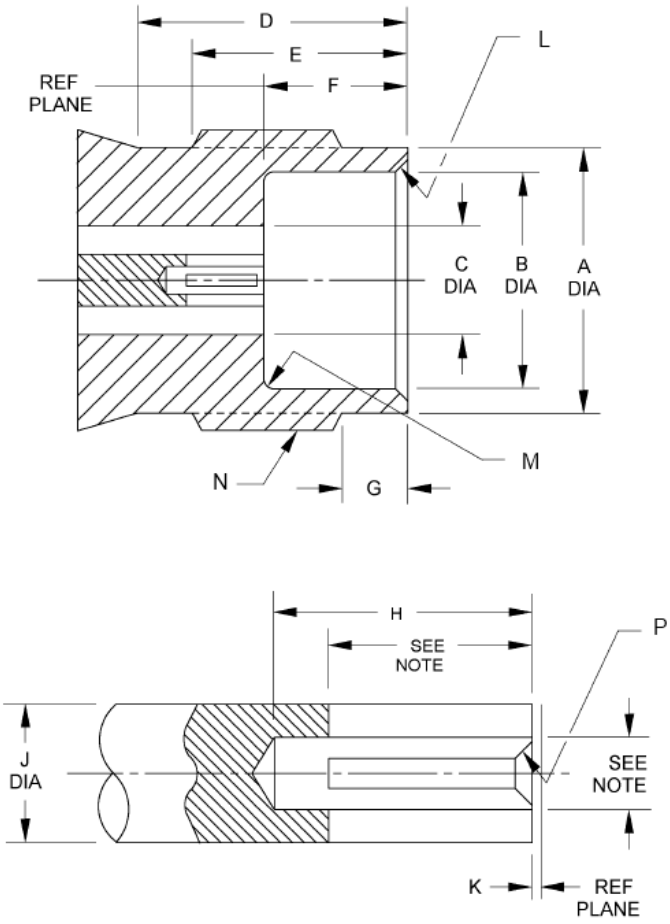
8.2.1. *2.4mm plug*





Symbols	Dimension (mm)		Comment
	Min	Max	
ØA	4.725	4.75	
ØB	2.387	2.413	
C	1.85	2.45	
D	M7 x 0.75-6g		
ØE	4.75	4.85	
ØF	1.029	1.054	
G	1.34	1.45	
ØH	0.506	0.523	
ØJ	0.2	0.25	
K	0	0.08	
L	0.25 x 45°±2	0.35 x 45°±2	Chamfer
M	28	32	°

8.2.2. ***2.4mm jack***



Symbols	Dimension (mm)		Comment
	Min	Max	
ØA	5.79	5.89	
ØB	4.77	4.8	
ØC	2.387	2.413	
D	6	-	
E	4.8	5.06	
F	3	3.1	
G	1.37	1.63	
H	2.65	-	
ØJ	1.029	1.054	
K	0	0.08	
L	0.1 x 45°±2	0.2 x 45°±2	Chamfer
M	-	0.127	Radius
N	M7 x 0.75-6g		
P	0.1 x 30°±2	0.15 x 30°±2	Chamfer

Note: Shall meet the electrical and mechanical performance requirements when mated with a 2.4mm pin as specified in this specification

Table 5: *Radiall Part Number*

Variant	Radiall Reference	Designation	
201	R413N00660	Attenuator 2.4mm DC - 50GHz	0 dB
202	R413N01660	Attenuator 2.4mm DC - 50GHz	0,5 dB
203	R413N02660	Attenuator 2.4mm DC - 50GHz	1 dB
204	R413N03660	Attenuator 2.4mm DC - 50GHz	1,5 dB
205	R413N04660	Attenuator 2.4mm DC - 50GHz	2 dB
206	R413N05660	Attenuator 2.4mm DC - 50GHz	2,5 dB
207	R413N06660	Attenuator 2.4mm DC - 50GHz	3 dB
208	R413N07660	Attenuator 2.4mm DC - 50GHz	3,5 dB
209	R413N08660	Attenuator 2.4mm DC - 50GHz	4 dB
210	R413N09660	Attenuator 2.4mm DC - 50GHz	4,5 dB
211	R413N10660	Attenuator 2.4mm DC - 50GHz	5 dB
212	R413N11660	Attenuator 2.4mm DC - 50GHz	5,5 dB
213	R413N12660	Attenuator 2.4mm DC - 50GHz	6 dB
214	R413N13660	Attenuator 2.4mm DC - 50GHz	6,5 dB
215	R413N14660	Attenuator 2.4mm DC - 50GHz	7 dB
216	R413N15660	Attenuator 2.4mm DC - 50GHz	7,5 dB
217	R413N16660	Attenuator 2.4mm DC - 50GHz	8 dB
218	R413N17660	Attenuator 2.4mm DC - 50GHz	8,5 dB
219	R413N18660	Attenuator 2.4mm DC - 50GHz	9 dB
220	R413N19660	Attenuator 2.4mm DC - 50GHz	9,5 dB
221	R413N20660	Attenuator 2.4mm DC - 50GHz	10 dB
222	R413N40660	Attenuator 2.4mm DC - 50GHz	20 dB

TABLE 6: *Measurements and inspections on completion of environment and endurance tests*

N°	Radiall Generic Spec. RAD-GEN-ATCH-002		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Test (1)	Test Method and Conditions	Identification	Conditions		Min	Max	
01	Vibration	Para. 13.2.6 of Generic specification and figure 2 of this specification	**Initial measurements** Attenuation **During Last Cycle** Intermittent contact **Final measurement** Visual Examination Attenuation drift	 Table 1 >0.5ms No open or short circuits No damage Table 1	 Att - - ΔAtt	 Record values - - ±0.05 ±0.5		 - dB or %(2)
02	Shock or Bump	Para 13.2.7 of Generic specification and figure 2 of this specification	**Initial measurements** Attenuation **Final measurement** Visual Examination Attenuation drift	 Table 1 No damage Table 1	 Att - ΔAtt	 Record values - ±0.05 ±0.5		 - dB or %(2)
03	Rapid Change of Temperature	Para 13.2.8 of Generic specification	**Initial measurements** Attenuation **Final measurement** Visual Examination Attenuation drift	 Table 1 After recovery time of 24±2hrs No damage Table 1	 Att - ΔAtt	 Record values - ±0.05 ±0.5		 - dB or %(2)
04	Climatic sequence	Para 13.2.9 of Generic specification Dry heat: para 13.2.9.1 of Generic specification Cold heat: para 13.2.9.3 of Generic specification	 Attenuation drift Attenuation drift **Final measurement** Visual Examination Attenuation drift	 At +125°C, Freq: 10GHz – 20GHz – 30GHz – 40GHz - 50GHz At -55°C, Freq: 10GHz – 20GHz – 30GHz – 40GHz - 50GHz After recovery time between 1 hr and 24 hrs No damage Table 1	 ΔAtt ΔAtt - ΔAtt	 -0.1 -1.0	 7.10^{-4}(3) 7.10^{-4}(3) +0.1 +1.0	 dB/dB/°C dB/dB/°C dB or %(2)
05	Coupling proof torque	Para 13.2.10	Interface dimensions	Para 13.2.11	-	Figure of para 13.2.11		-
06	Mating and unmating forces	Para 13.2.11	Torque	Para 13.2.11	-	-	24	N.cm
07	Connector Repeatability	Para 6 of this specification	Attenuation drift	Table 1	ΔAtt	±0.05 ±0.5		dB or %(2)
08	Operating Life	Para 13.2.12 and table 3 and 4 of this specification	**Initial measurements** Attenuation **Final measurement** Visual Examination Attenuation drift	 Table 1 No damage Table 1	 Att - ΔAtt	 Record values - ±0.10 ±1		 - dB or %(2)
09	RF leakage	Para 13.2.13 of Generic specification	**RF leakage**	Para 13.2.13 DC to 50GHz	E	-	-85	D B
10	Peak power	Para 13.2.14 of Generic specification and table 2 of this specification	**Final measurement** Attenuation	Table 1	Att	Table 1		
11	Permanence of marking	Para 13.2.16 of Generic specification	**Final measurement** Visual Examination	No corrosion or obliteration of marking	-	-		-

Notes:
(1) The tests in this table refer to either para 11 and 12 of Generic specification and shall be used as applicable
(2) Whichever is greater
(3) or ±0.1dB whichever is greater.